salis in North America North of Mexico. Rhodora **60**: 107-114; 128-142; 152-173.
————. 1959. *Separotheca*, A new Genus (Commelinaceae) from Mexico. Rhodora **61** (725): 136-139.
Waterfall, U. T., and Mahler, W. F., 1964. *Baccharis* (Compositae) in Oklahoma, Texas and New Mexico. Southwestern Naturalist **9** (3): 189-202.
Waterfall, U. T., 1967. *Physalis* in Mexico, Central America and the West Indies. Rhodora **69**: 82-120; 203-239; 319-329.

JACK W. STANFORD
HOWARD PAYNE COLLEGE
BROWNWOOD, TEXAS 76801

THE ENVIRONMENT OF SCHISTOSTEGA PENNATI (HEDW.) HOOK. & TAYL.: NEW VERMONT STATIONS

DONOVAN R. BOWLEY[1]

Schistostega pennati is the sole member of the moss family Schistostegaceae. It has attracted attention over the years primarily because of its characteristic of reflecting light back out of the crevices it grows in, with a chatoyant green-gold glow. Every six or eight years someone reports a new station, ranging in size from pea-sized patches to the magnificent expanse of several yards under the barn at Oldfields, in Groton, New Hampshire (Thomson, 1956). In most of the literature it will be found under *S. osmundacea* (Dicks.) Mohr. Most often it is discovered as a glowing mass of protonema on damp soil or rock in some dark crevice. Occasionally fertile and sterile fronds

[1]Biology Department, Boston University, Boston 02116. This note is on part of the work done under NDEA Title IV Fellowship number 02022.

are found as well, looking like diminutive ferns of the genus *Osmunda*. Grout (1935) gives a concise description of the plant. Marshal (1920) has a good description and several drawings.

This plant is apparently circumboreal and tolerates a wide range of conditions. J. S. Erskine (1950) found it on slate a few yards from an arm of Halifax Harbour, N.S. D. S. Johnson (1925) found a maritime station at Mt. Desert Island, Maine. Here, the moss grew three or four feet above the high tide within the range of the salt spray, and in fact, on some *Fucus* that had washed into its cranny. In this particular station, the only light it received was that reflected into its cavern from the surface of the ocean. Schofield (1969) reported it "in shallow caverns, and on the raw earth of overturned tree roots in swampy parts of cedar-hemlock forests."

Early information suggested it was a calciphobe, but Grout (1933) found it in a crevice of a limestone cliff in a quarry. At this station, it was growing "in the open" in a crevice of a north-facing cliff.

The more typical site is that described by Grout (1899, 1902a, 1902b, 1906), Kaiser (1921), and Nichols (1933). Each of these sites is a moist crevice, usually in the back of a larger cavern or hole; or a moist cellar under a shed or a barn. Champlin (1969) found it inside the entrance to a graphite mine in Rhode Island.

It appears that in nearly every case the moss is located on a condensing surface, rather than where water is actively flowing. Johnson (1925) reported that the moss in the seaside station in Maine obtained its water from condensation on the cooler rock, of fog, or of water evaporated from the surface of the ocean.

A review article by J. M. Coulter (1918) of the work in Japan of Viscount Toda reveals some interesting notes on the physiology of the moss. The protonema can live seven months in culture without producing a leafy shoot. "Chromatophores" scatter in a day and change direction of orientation in seven to ten days. Spores germinate in

one month at 60-77°F. The leafy shoot dies at about 0°F; the protonema survives to –5°F. The optimum temperature for the leafy shoot is 60-77°F. Gistl (1926) reports lens-like cells in the protonema, which focus light within the cell. At the focus of the light are located the chloroplasts. This cell develops best when subjected to unidirectional light. He cultured *Schistostega* for three years in the laboratory and found that under optimum conditions the position of the chloroplasts could change in from one to three hours.

So we have in this small plant an adaptation to low levels of unidirectional light, giving it a competitive edge in those situations. The readjustment to changes in light is rapid, and would enable it to survive in areas where its caverns under rocks and tree roots were shifted by storm or wind. As evidenced by its growing on raw earth in the open in British Columbia (Schofield, 1969), on the cliff where Grout found it (1933), and in full sunlight in Gistl's laboratory (1926), it can survive in the open. It is most likely an early colonizer in humid, cool locations, but is rapidly overgrown by heartier vegetation, and survives in the hollows and crevices where the other plants cannot follow.

During the summer of 1969 several new stations for the luminous moss were discovered by Duncan Galbraith of Essex Junction, Vermont, and by the author. Two more stations were discovered in the summer of 1971 by Ranger-guide Kenn Boyd of Burlington, Vermont. All of the stations are mid-talus slope on the east side of Mt. Mansfield, Vermont. All are within half a mile of Cliff House (top station of the Gondola lift). Grout (1906) reported similar stations on the "Nose" cliffs of Mt. Mansfield.

One station near Cliff House was observed through the winter of 1969-1970. Ground heat and warmer air rising through the talus from below passed through the crevice, melting all the snow out of the crevice and from in front of the opening of the rocks. A small hole opened through to the "outside world". As the temperature of the outside

air rose, the opening became larger. As the outside air temperature fell, rime ice formed around the rim of the opening, closing it down — in effect, a natural thermostat. Measurements on a Taylor maximum-minimum thermometer suspended through the hole on a string showed a nearly constant internal temperature of 35°F, ±1°F, while the outside temperature varied through a 31°F range. In addition, the thin shell of snow that remained over the hollow acted as a sort of "greenhouse roof", allowing light to pass through.

In summer, the temperatures of his "moss-hole" were lower than that of the surrounding woods because of cool, moist air draining down out of the talus above. Both summer and winter there was a slight excurrent of moist air.

LITERATURE CITED

British Bryological Society. 1946. "Annual meeting of the British Bryological Society, 1946." Bryologist **49:** 99.

CAMPBELL, DOUGLAS H. 1918. The structure and development of mosses and ferns, 3rd edition. Macmillan Company, New York.

CHAMPLIN, R. L. 1969. "A Rhode Island station for luminous moss." Rhodora **71:** 305.

CONARD, HENRY S. 1938. "The foray in upper Michigan, 1937." Bryologist **41:** 20.

COULTER, J. M. 1918. Review in Bot. Gaz. **67:** 278-279.

ERSKINE, J. S. 1950. "More minute mosses from Nova Scotia." Bryologist **53:** 54-56.

GISTL, R. 1926. "Bezichung zwischen licht und Schistostega-vorkeim." Ber. d. Deut. Bot. Ges. **44:** 483-492.

GROUT, A. J. 1899. "An annotated list of rare or otherwise interesting mosses occurring in or near Plymouth, New Hampshire." Rhodora **1:** 54.

———— 1902a. "A new habitat for *Schistostega*." Bryologist **5:** 103.

———— 1902b. "Notes on Vermont Mosses." Rhodora **4:** 182.

———— 1906. "Notes on Vermont Bryophytes — 1906." Bryologist **10:** 6, 7.

———— 1933. "Miscellaneous notes on mosses." Bryologist **36:** 25.

———— 1935. Moss flora of North America. vol. 2, part 2. By the author. Newfane, Vermont.

———— 1940. "Moss notes, 1940." Bryologist **43:** 75.
HUNTINGTON, J. W. 1902. "How I found *Schistostega osmundacea.*" Bryologist **5:** 52.
JOHNSON, D. S. 1925. "A maritime station for *Schistostega osmundacea.*" Bryologist **29:** 18-19.
KAISER, G. B. 1921. "Little journeys into moss-land. IV — the luminous moss." Bryologist **24:** 48.
MARSHALL, N. L. 1920. Mosses and lichens. Doubleday, Page, and Co. pp. 199-202.
NICHOLS, G. E. 1933. "Notes on Michigan bryophytes — II" Bryologist **36:** 75.
SCHOFIELD, W. B. 1969. "Some common mosses of British Columbia." British Columbia Provincial Museum, Handbook No. 28.
THOMSON, J. W. 1956. The 1956 foray of the American Bryological Society." Bryologist **60:** 41.

A NEW STATION FOR *SAXIFRAGA RIVULARIS* L. IN THE WHITE MOUNTAINS, NEW HAMPSHIRE

On June 18, 1969 Dr. Rosemary Mackay of Montreal drew my attention to a small group of plants growing at the southwest corner of the Appalachian Mountain Club Lake-of-the-Clouds Hut located at 5,000 ft. on the slope of Mt. Washington (Fig. 1). The plants were *Saxifraga rivularis* L. primarily known in recent years from a small station on the summit of Mt. Washington at 6,288 ft. (Pease, 1964). The identification was confirmed by the late Dr. Stuart K. Harris of Boston University. A specimen has been deposited in the herbarium of the University of New Hampshire.

The station includes about 15 plants growing in a compact group. Most plants were in flower on June 18, and by July 3, 1969 most had set fruit. Further checks in June, 1970, 1971 and 1972 showed the plants to be persisting and in 1971 and 1972 to be spreading slightly.

Porsild (1957) notes that *Saxifraga rivularis* is found on wet and mossy areas and on wet cliffs and by brooks in the arctic. However, Britton (1957) suggests that it may be found on fairly well-drained substrates. Both the *S. rivularis* stations described here are comparatively dry,